CLAIMS

1. An internal combustion engine, comprising:
an engine block defining at least one cylinder therein, an inlet port communicating between said cylinder and a source of air, and an exhaust port through which air is exhausted from said cylinder;
a piston movably mounted within said cylinder;
an intake valve selectively occluding said intake port;
an exhaust valve selectively occluding said exhaust port;
a compressor in fluid communication between said source of air and said inlet port,
whereby at least part of the intake air is selectively compressed by the compressor prior to entering the cylinder.

2. The engine of claim 1, further comprising at least one air cooler interconnected between said compressor and said inlet port.

3. The engine of claim 2, further comprising an air delivery network including:
conduit interconnecting said source of air, said compressor, said air cooler, and said inlet port; and
means for selectively controlling operation of said compressor to operate in either a compress mode generating a compressed air charge or a pass mode passing air therethrough without compressing.

4. The engine of Claim 3, wherein said air delivery network further includes means cooperating with said means for selectively controlling operation for selectively controlling the air charge characteristics selected from one or more of density, pressure, temperature, and the mean and peak pressure within said cylinder.

5. The engine of Claim 4, wherein both of said means for selectively controlling comprise a common plurality of valves strategically placed along said conduit and a common engine control mechanism controlling the operation of said valves.

6. The engine of claim 5, further comprising :
a second compressor in fluid communication between said compressor and said inlet port,
whereby at least part of the intake air is selectively compressed a second time prior to entering the cylinder; and
wherein said delivery network includes means for controlling the operation of said second compressor: and
wherein said means for selectively controlling the air charge characteristics cooperates with said means for controlling the operation of said compressor and with said means for controlling the operation of said second compressor for selectively controlling the air charge characteristics selected from one or more of density, pressure, temperature, and the mean and peak pressure within said cylinder.

7. The engine of Claim 1, wherein said compressor is a reciprocating compressor.

8. The engine of Claim 7, wherein said reciprocating compressor includes a piston connected to the engine crankshaft.

9. The engine of Claim 1, wherein said compressor is a rotary compressor.

10. The engine of claim 1, further comprising :
a second compressor in fluid communication between said compressor and said inlet port,
whereby at least part of the intake air is selectively compressed a second time prior to entering the cylinder.

11. The engine of Claim 10, wherein said engine block defines a second inlet port opening to said cylinder, and wherein said engine further comprises:
at least one an air cooler;
an air delivery network including:
conduit interconnecting said source of air, said compressor, said second compressor, said air cooler, said inlet port and said second inlet port; and
means for selectively controlling operation of said compressor to operate in either a compress mode generating a compressed air charge or a pass mode passing air therethrough without compressing.
means for selectively controlling operation of said second compressor to operate in either a compress mode generating a compressed air charge or a pass mode passing air therethrough without compressing.
means for selectively directing a compressed air to said first inlet port and uncharged air to said second inlet port.

12. In an internal combustion engine having a crankshaft driven by at least one piston moving through at least a compression stroke and an expansion stroke aided by combustion taking place within a cylinder, wherein the compression stroke results in the compressing of air and gaseous fuel within the cylinder, the improvement thereto comprising:
an external compression stage in which an air charge is compressed outside the cylinder; and delivery conduit linking said compression stage

to the cylinder.

13. The improvement of Claim 12, further comprising an intercooler through which said air charge is selectively directed from said external compression stage.

14. The improvement of claim 12, further comprising a second external compression stage in which said air charge is compressed a second time outside the cylinder.

15. A method of operating an internal combustion engine having a crankshaft driven by at least one piston moving through at least a compression stroke and an expansion stroke aided by combustion taking place within a cylinder, wherein the compression stroke results in the compressing of air and gaseous fuel within the cylinder, said method comprising the step of managing air charge densities, temperatures, pressures, and turbulence.

16. The method of claim 15, wherein the managing step includes at least the steps of compressing an air charge prior to the compressing within the cylinder, thus generating a pre-compressed air charge.

17. The method of claim 16, wherein the managing step further includes at least the step of selectively channeling the pre-compressed air charge through a cooling device prior to delivery to the cylinder.

18. The method of claim 17, further comprising the step of providing a compression ratio lower than the expansion ratio of the engine.

19. A method of operating an internal combustion engine, said method comprising the steps of:

(i) producing an air charge;

(ii) controlling the temperature, density and pressure of the air charge;

(iii) transferring the air charge to a power cylinder of the engine such that an air charge having a weight and density in a range ranging from below atmospheric weight and density to a heavier-than-atmospheric weight and density is introduced into the power cylinder;

(iv) then compressing the air charge at a lower-than-normal compression ratio;

(v) causing a pre-determined quantity of charge-air and fuel to produce a combustible mixture;

(vi) causing the mixture to be ignited within the power cylinder; and

(vii) allowing the combustion gas to expand against a piston operable in the power cylinder with the expansion ratio of the power cylinders being substantially greater than the compression ratio of the power cylinders of the engine.

20. The method of claim 19, further comprising the steps of: repeating steps (i) through (vii); and periodically selectively varying the weight and density of the air charge from one transferring step to another transferring step.

21. The method of claim 19, further comprising the steps of: repeating steps (i) through (vii); and maintaining the weight and density of the air charge at substantially the same pre-selected weight and density during each of the repeated transferring steps.

22. An internal combustion engine, comprising:

at least one ancillary compressor for compressing an air charge;

an intercooler through which the compressed air is selectively directed for cooling;

a plurality of power cylinders in which the combustion gas is ignited and expanded;

a piston operable in each power cylinder and connected to a crankshaft by a connecting link for rotating the crankshaft in response to reciprocation of each piston;

a transfer conduit communicating the compressor outlet to a control valve and to said intercooler;

a transfer manifold communicating the intercooler with the power cylinders through which manifold the compressed charge is transferred to enter the power cylinders;

an intake valve controlling admission of the compressed charge from the transfer manifold to said power cylinders; and

an exhaust valve controlling discharge of the exhaust gases from said power cylinders.

23. A method of operating an internal combustion engine, said method comprising the steps of repeatedly compressing air charges within a cylinder of the engine and producing mean effective cylinder pressure within the cylinder which mean effective cylinder pressures range over time from lower-than-normal to higher-than-normal.

24. The method of claim 23, wherein the maximum cylinder pressure remains below normal.